instruction manual

FT-B704
Return to
Meter Crib
Final Test
or, RF-1?
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Sorensen

Product Support
Lab.
Dept. 5124

Sorensen & Company, inc.

Richards Avenue
South Norwalk, Conn.

"MR"

NOBATRON RANGERS

MODEL 36-15

Product Support
Lab.
Dept. 5124

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SORENSEN & COMPANY, INC., Richards Avenue, South Norwalk, Connecticut

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I. GENERAL INFORMATION

PLEASE READ THIS MANUAL. We think it will help you to obtain the maximum performance from your new Sorensen instrument.

SHIPPING DAMAGE

Sometimes instruments are damaged in transit. We strongly suggest that you inspect and test your instrument as soon as you receive it. If the instrument is damaged or if it fails to operate properly, you should ask the carrier to inspect the shipment. The carrier's claim agent will prepare a report of damage which you should send to us. We will then tell you how to have the instrument repaired or replaced.

SERVICE INFORMATION

If you have any questions about the operation, repair, or servicing of a Sorensen instrument, please contact our local representatives. (A list of representatives appears in the Condensed Catalog at the rear of this manual.) If it is more convenient you may contact us directly at the Service Department, Sorensen & Co., Inc., Richards Avenue, South Norwalk, Connecticut.

IMPORTANT

BE SURE TO INCLUDE THE MODEL & SERIAL NUMBER IN ALL CORRESPONDENCE CONCERNING THIS INSTRUMENT. WITHOUT THIS INFORMATIOI WE MAY NOT BE ABLE TO GIVE YOU PROMPT AND ACCURATE SERVICE.

RETURNS TO THE FACTORY

Should you decide to return an instrument to us for repair, please contact us for authorization to make shipment. We have a number of local service facilities in the United States and Canada which are equipped and staffed to provide you with fast, efficient service. For this reason, we reserve the right to refuse unauthorized shipments to our plant.

WARRANTY

This instrument is warranted by Sorensen & Company, Inc., to be free from defects in material and workmanship. Our obligation under the warranty is limited to servicing the instrument and replacing defective parts when the instrument is returned to the factory with transportation charges prepaid. No other warranties may be implied. The period of warranty is one year after the delivery of the instrument to the original purchaser. Defects caused by improper operating conditions, accidents, misuse, negligence, and the alteration or removal of the nameplate, will void the warranty.

II. SPECIFICATIONS

The Model "MR" Nobatron Rangers are tubeless DC power supplies designed to provide a continuously adjustable output voltage. These instruments use magnetic amplifier circuitry together with a transistorized control circuit containing a silicon diode reference element.

Condensed Specification Chart

The specifications for the "MR" Nobatron Rangers are listed below in table form. Special notes with further details follow on the next page.

Model		MR36-15	MR36-30	MR150-7.5
Input Voltage		105-125 VAC, Single Phase, 60 cycles		
Input Current (Max.)		15 Amps	30 Amps	30 Amps
Output Voltage		5-36 VDC	5-36 VDC	20-150 VDC
Output Current		0-15 Amps	0-30 Amps	0-7.5 Amps
Regulation Accuracy	Line	±0.25%		
	Load	±0.50%		
Ripple (Max.)		1% RMS at maximum output voltage		
Recovery Time		0.2 Seconds		
Transient Excursion (Max.)		6V	6V	25V
Ambient Temperature Range		15°C (61°F) to 35°C (95°F)		
Weight (Net)		100 lbs.	175 lbs.	175 lbs.
Dimensions (Self-Contained)		19-1/8" Wide 12-3/4" High 14-7/8" Deep	19-1/8" Wide 21-1/16" High 14-7/8" Deep	19-1/8" Wide 21-1/16" High 14-7/8" Deep
Input Connection		Line Cord	Terminal Board (Rear)	
Output Connection		Binding Posts (Front Panel) and Terminal Board (Rear)		
Protective Components	Input Fuse	15 Amp	30 Amp	30 Amp
	Overcurrent	Circuit Breaker combined with On-Off Switch		
Meters		Voltmeter and Ammeter Standard		

Specifications - Special Notes

Input Frequency

Operation over the range of 45-65 cycles is possible with restrictions on the input or output voltage range and output current ratings. The specified regulation accuracy applies only to 60 cycle operation, and regulation over the frequency range is not guaranteed. In addition, ripple voltage increases at lower frequencies.

Regulation Accuracy

The regulation accuracy for load changes is defined as ≤ 0.50% against load changes from no load to full load current at any fixed input line voltage from 105-125 VAC. The regulation accuracy for line changes is defined as ≤ 0.25% against any line change from 105-125 VAC at a fixed load current from 0 to full load. Note that regulation accuracy applies to line and load separately so that if line and load are both changed, the total regulation accuracy becomes ≤ 0.75% maximum.

Ripple

The ripple specification is defined as 1% RMS at the maximum output voltage setting, and will increase to a maximum of 2.5% RMS at the lowest voltage setting. The above conditions apply only to 60 cycle operation, and the ripple will increase to approximately twice this amount if the input frequency is decreased to 45 cycles.

Recovery Time

Recovery Time is stated as 0.20 seconds for a 10% line voltage change within the instrument's rating, or a 50% step change in the load current. Recovery time is defined as the time for the output to effect a 63% recovery from the maximum deviated value.

Maximum Transient Excursion

This value is the peak voltage above or below the nominal operating level, caused by a change of line or load as defined under Recovery Time above.

Ambient Temperature Range

If operation above 35°C (95°F) is attempted, the life of various components may be reduced. In some cases, operation at reduced loads is possible at higher or lower ambients. This is at the discretion and responsibility of the user.

Below 15°C (61°F) the high initial ripple will be decreased as the unit warms up.

III. INSTALLATION & OPERATION

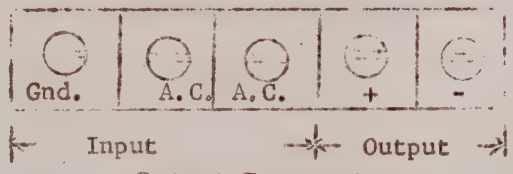
Rack Mounting or Bench Operation

These instruments when originally purchased may be supplied self-contained for bench top operation or equipped for mounting in a standard 19" relay rack. In the event it is later desired to rack mount a self-contained unit or vice versa this may be accomplished without difficulty. The user should contact our local representative or the Sorensen Service Department for the necessary parts and instructions for conversion.

Input Connections

Model MR36-15 - The input power is applied by means of a line cord that is equipped with a three prong plug. Since the third prong of this plug is attached to the chassis of the instrument, connection of the line cord to a suitable three wire receptacle automatically grounds the instrument. If a three wire receptacle is not available, then a three to two wire adapter should be used. In this case, the third wire from the adapter should be connected to an earth ground or the electrical system ground.

Models MR36-30 and 150-7.5 - The input power is connected directly to the terminal board located on the rear chassis of the instrument. Upon removing the rear cover, this terminal board will be exposed. A separate ground terminal is provided, and this terminal is connected to the metal chassis for safety grounding.



Output Connections

The DC output of these instruments may be either connected to the binding posts on the front panel, or to the terminal board located at the rear (note drawing above). When making the output connections be sure to observe polarity.

Air Circulation

Natural convection cooling is employed with these instruments. The installation must be such that free air circulation is available through the bottom and top of the cabinet. On self-contained units the feet elevate the instrument 1" to provide air access. In rack installations, a similar provision should be made.

All controls for the operation of these instruments are located on the front panel.

On-Off Switch - This switch is both a manual on-off switch and a magnetic trip overcurrent breaker. This switch will trip under short circuit or severe overload conditions.

Output Voltage Adjustment - The output voltage is continuously adjustable by means of the two potentiometer knobs (coarse and fine) located on the front panel.

Meter Range Switch - The Models MR36-30 and MR150-7.5 provide a spring-return meter range switch which automatically returns the voltmeter to the highest scale when released. It is used primarily for fine metered adjustment of the output voltage at low voltage settings. CAUTION: NEVER SET THIS SWITCH TO A LOWER SCALE VALUE THAN THE METER IS READING OR SERIOUS DAMAGE TO THE VOLTMETER MAY RESULT.

Pilot Lamp - This lamp indicates when the input power is on.

Meters

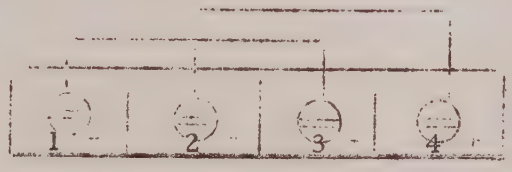
A triple scale voltmeter is supplied on the Models MR36-30 and MR150-7.5 which is used in conjunction with the meter range switch noted above. A single scale voltmeter is supplied with the Model MR36-15.

A single scale ammeter is supplied on all models.

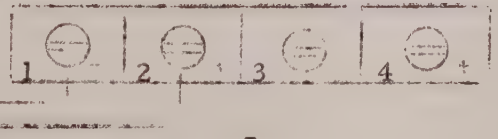
Remote Sensing

One of the features of these instruments is that remote sensing at the load is available. The connections for remote sensing are located on the terminal board at the rear of the instruments. The Models MR36-30 and MR150-7.5 have separate remote sensing terminal boards, while the Model MR36-15 has remote sensing terminals on the same terminal board as the input and output connections.

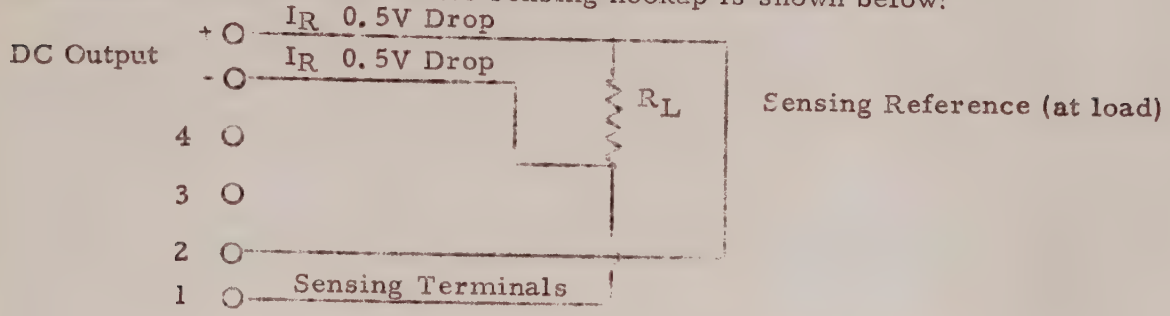
For normal operation (no external sensing) these terminals should be linked as shown:



If remote sensing is desired, the jumpers shown above should be removed, and the connections to the load made directly to terminals 1 and 2.



A schematic for the full remote sensing hookup is shown below:



IMPORTANT

WHEN REMOTE SENSING BE SURE TO USE HEAVY GAUGE WIRE FROM THE OUTPUT TERMINALS TO THE LOAD. IT IS RECOMMENDED THAT THE VOLTAGE DROP NOT EXCEED 0.5 VOLT PER WIRE. THE SENSING LEADS (TERMINALS 1 & 2 TO LOAD) SHOULD HAVE A TOTAL IR DROP NO GREATER THAN 50 MILLIVOLTS AT 0.5 AMP.

Protective Devices

Overcurrent Breaker - As noted under Controls, an overcurrent breaker is combined with the On-Off Switch in these instruments. This breaker-switch is a single pole type, thus even when it is in the off position voltages exist at various points within the instrument. It is therefore recommended that the internal circuitry not be touched until the input power has been disconnected externally, either by a line switch or the removal of the input line plug from the power circuit.

CAUTION: OPERATION OF THESE INSTRUMENTS ABOVE THE RATED OUTPUT CURRENT WILL CAUSE OVERHEATING, AND MAY REDUCE THE LIFE OF VARIOUS COMPONENTS.

Input Fuse - An input fuse is provided on the front panel to protect the instrument's circuitry in the event of an internal failure.

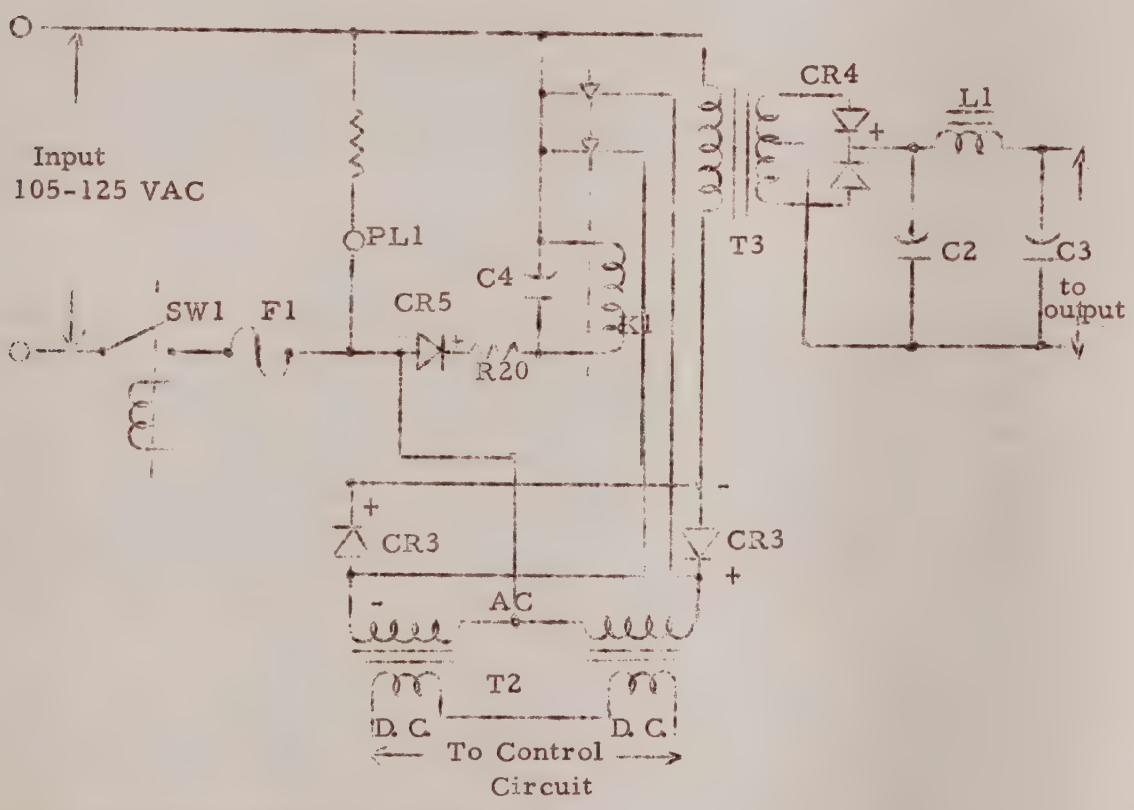
Starting Circuit - A starting circuit is provided in these instrument's to prevent output voltage surges.

IV. PRINCIPLE OF OPERATION

The operation of your MR Nobatron can best be understood by referring to the typical schematics shown below. If exact information is required, reference should be made to the schematic covering that particular model. Such schematics are furnished with each unit.

Sorensen Model MR Nobatron Rangers employ a power, self-saturating magnetic amplifier followed by a filter section, together with a tubeless control circuit.

Power and Filter Circuit



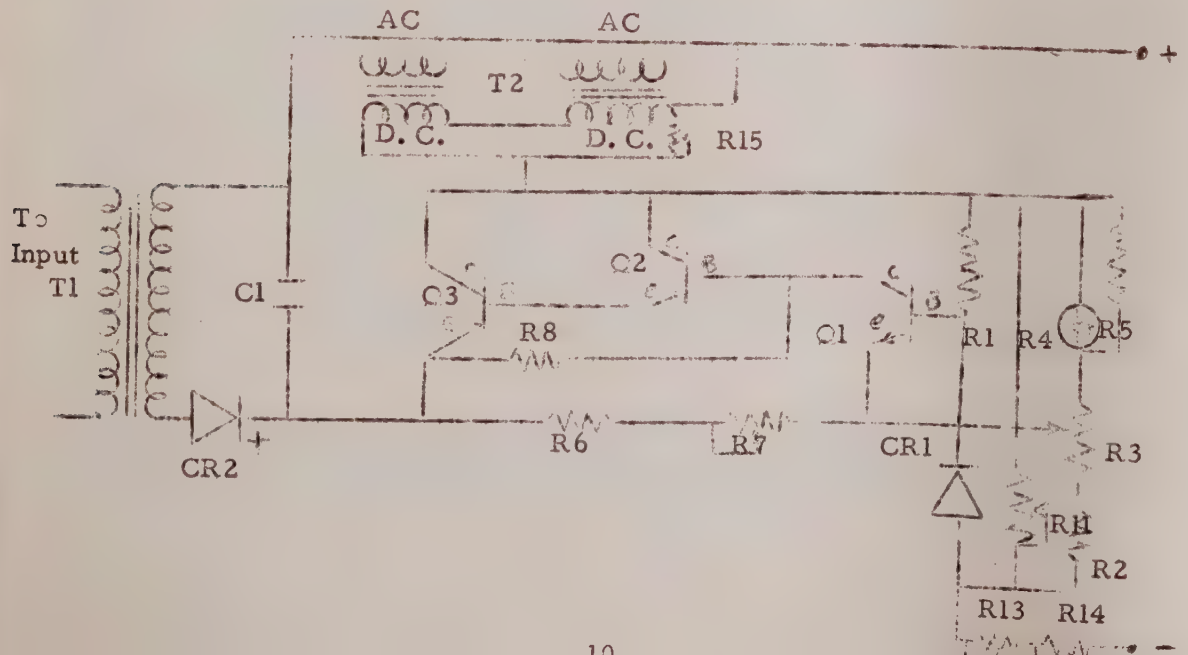
T2 - Self-saturating magnetic amplifier
T3 - Rectifier input transformer
CR3 - Magnetic amplifier rectifier
CR4 - Power silicon rectifier
L1 - DC Filter Choke
C2 - Input filter capacitor
C3 - Output filter capacitor
SW1 - Input Switch (front panel) combined with overcurrent breaker
F1 - Input Fuse
PL1 - Pilot Lamp
K1, CR5, C4, & R20 - Starting Circuit (Time Delay Relay)

A detailed explanation of the theory of the magnetic amplifier is beyond the scope of this manual. In simple terms, however, the AC coils on the reactor may be considered to act as "gates" which open at some time during the half cycle in which the rectifier CR3 allows conduction. Until the gate opens, no current flows. After the gate opens, current flows and is restricted only by the impedance of the load circuit. Thus the average current, and hence the voltage is controlled by the fraction of the half cycle period that the gate is open. For example, if the input voltage is reduced, the current flow during the conducting period will be reduced. Therefore, the gate must be opened earlier to maintain the same output voltage.

Opening the gate is controlled by the current in the DC windings of the magnetic amplifier, T2. This self-saturating reactor differs from non-self-saturating type reactors in that with no control current a large output current and voltage will result. Adding control ampere turns with the same polarity as the power ampere turns, as determined by the rectifier CR3 will increase the output, and conversely reducing the control ampere turns will decrease the output.

Control Circuit

The control circuit in these instruments is a "Power Reference" consisting of a series transistor voltage regulator. The output of the instrument is compared directly to the reference through the control winding of the magnetic amplifier, T2. Any change in the output due to line or load change produces an "error" voltage across the control winding. This voltage causes a current flow which changes the firing point of the magnetic amplifier, thus correcting for the change in output. The degree of correction, and hence the regulation accuracy is determined by the gain of the magnetic amplifier core, the windings, and the regulation accuracy of the "power reference".



T1 - Control Power Transformer
T2 - Magnetic Amplifier
C1 - Control Filter Capacitor
CR1 - Reference Diode
CR2 - Control Power Rectifier
Q1 - Amplifier
Q2 - Amplifier
Q3 - Series Passing Transistor

R1 - Dropping Resistor for Reference Diode CR1
R2, 3 - Voltage divider Resistor & Pot.
R4, 5 - Temperature Comp. Resistors
R6, 7 - Line Comp. Resistor & Pot.
R8 - Q1 Bias Resistor
R11 - Bleeder Resistor for Reference
*R13 - Output Voltage Coarse Adjust
*R14 - Output Voltage Fine Adjust

* Located on Front Panel.

1. Bleeder Network - Adjustable resistor R11 together with the output voltage adjustment potentiometers R13 and 14 form a high current bleeder network with R2 and 3. Their purpose is to insure that the power reference is always loaded, despite negative current being drawn by the control coil. If the control coil current becomes larger than the current provided by the bleeder network, the transistor reference will go out of regulation, and the output voltage will rise.

2. Transistor Circuit - The transistor circuit works on the following principle: The DC (+) voltage is taken from the (+) output of the Nobatron plus the auxiliary power supply consisting of T1, CR2, and C1. The negative return of this output goes directly to the negative (-) output of the Nobatron. Transistor Q3 is connected between the positive output of the rectifier and the positive output of the Reference. This transistor serves as a variable impedance which controls the output voltage. The impedance is varied by the transistor amplifier consisting of Q1 and Q2 which controls the base current of Q3. The first amplifier stage Q1 is controlled by a bridge circuit consisting of components R1, R2, R3, R5, R13, R14, and CR1.

   A typical sequence of operation would be as follows: an output voltage variation is detected between the base and emitter of Q1, since Q1 is at a fixed potential above the negative output terminal, (action of CR1). For example, suppose the output should tend to go more positive. Normally, the emitter is slightly negative with respect to the base. The positive action would tend to make the emitter less negative with respect to the base, because of the action of the resistor network consisting of resistors R2-5, R13 and 14. In lowering the Q3 base to emitter voltage, the transistor collector current will be reduced, therefore reducing the base currents of Q1 and Q2. Lowering the base current of Q3 results in a higher impedance between the emitter and collector of Q3 which in turn results in a reduction of output voltage, hence regulation.

3. Reference Diode - The silicon diode, CR1, is operated in its zener or reverse voltage region. Under this condition, a constant voltage will appear at the terminals of the diode as the current varies within certain limits.

4. Temperature Compensation - Resistors R4 and 5 form the temperature compensation network.

5. Line Compensation - Line compensation is accomplished in the "power reference" itself by applying voltage from the + side of the power supply for the transistor amplifier through resistors R6 and 7 to the emitter of C1.

V. MAINTENANCE & REPAIR

Maintenance

During normal life these instruments require no maintenance other than the care afforded similar equipment. It is suggested that excessive dust, etc. be removed periodically exercising care to prevent damage by cleaning tools or excessively strong air blasts.

Spare Parts

All components used in these instruments are of a good commercial grade and can be expected to give a reasonably long period of trouble free service. As the age of the instrument increases, some components are likely to deteriorate. We suggest that you note those items asterisked on the Parts List, which we recommend be kept on hand.

In the event it becomes necessary to replace any part, we strongly suggest that the replacement parts be of the same value as the original. Substitute parts should not be used unless we assure you that the substitute part will not impair the performance of your instrument.

Repair

CAUTION: DANGEROUS VOLTAGES EXIST IN THESE INSTRUMENTS. PLEASE OBSERVE APPROPRIATE PRECAUTIONS.

Trouble Shooting Chart

Symptom	Cause	Procedure for Repair
No Output Voltage	Input Fuse Blown	Replace fuse
	Breaker SW1 tripped	Reset
	Open Power Circuit	Check T2 power windings and volt. Check T3 voltage Check CR3, 4, L1, or Ammeter

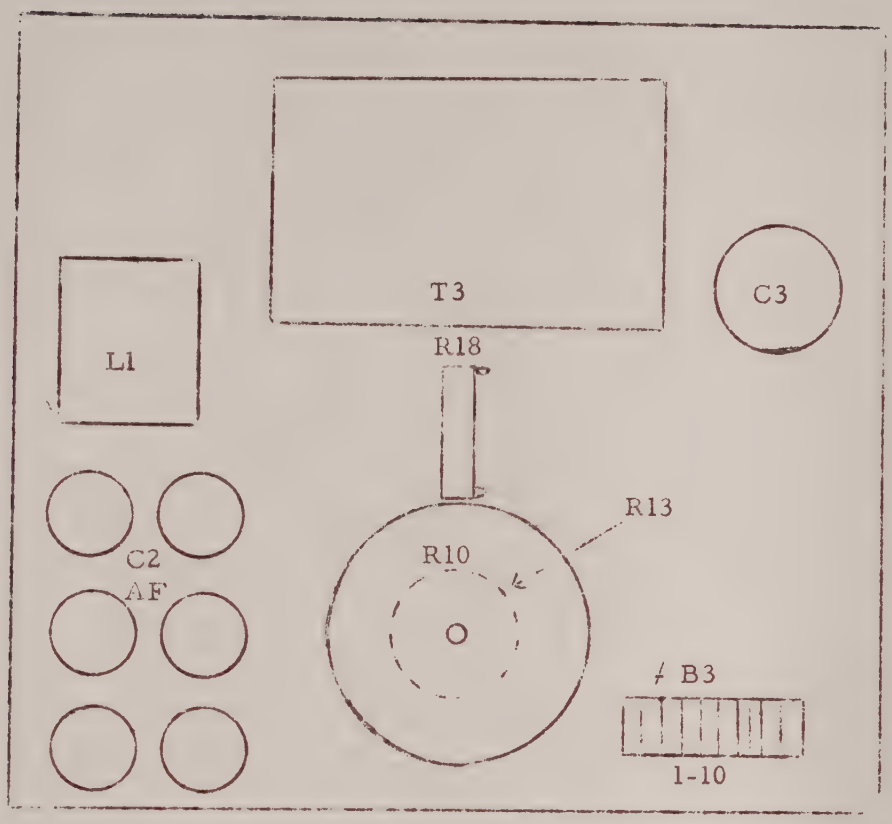
Symptom	Cause	Procedure for Repair
High Output Voltage	Control Circuit Failure	Check control circuit per schematic for test voltages. Typical causes could be failure of Q1- Q3, CR2, C1, T1 or T2.
Low Output Voltage	Control Circuit Failure	Check control circuit per schematic for test voltages. Typical causes could be failure of CR1, or Q1-Q3 shorted emitter to collector.
High Ripple	Filter Circuit Failure	Check capacitors C2&3, L1.
Poor Regulation	Failure of CR1	Check or replace diode CR1
	Failure of Line Compensation	Adjust Potentiometer R7 Check R6
Periodic Oscillation (hunt)	Excessive high gain in T2	Adjust resistor R15 in parallel with T2 control winding. Check R6 and 7
Unable to obtain full range of output voltage adjust.	Misalignment of adjustment	High end - adjust slider on R11 Low end - adjust R3

Typical Voltage Measurements

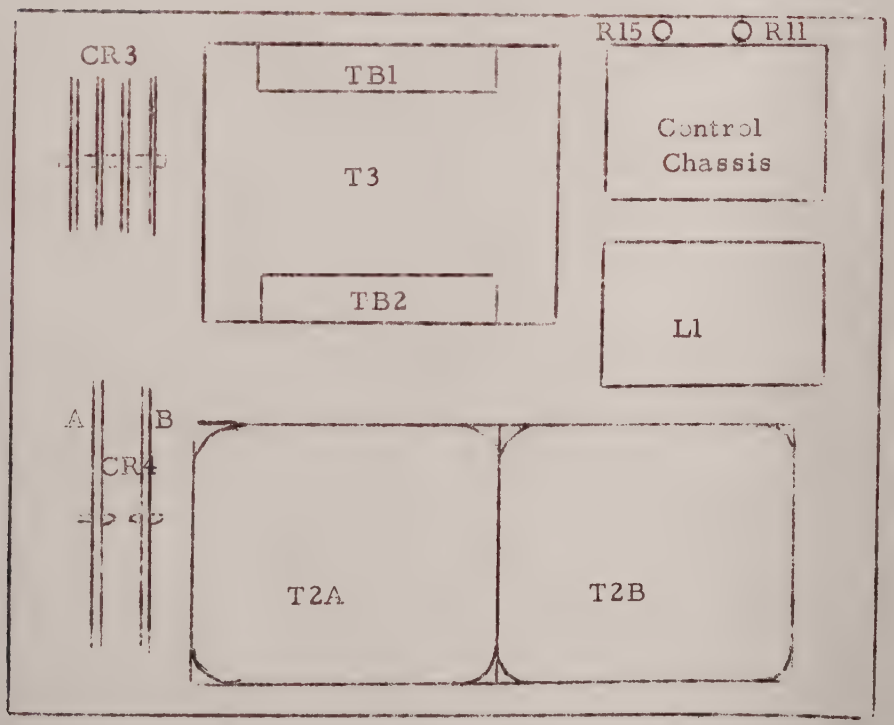
Typical circuit voltages are shown below. All DC voltage measurements should be taken with a 20,000 ohms per volt meter. Readings should be taken at 115VAC input, nominal output voltages and one-half rated current.

Components	MR36-15	MR36-30	MR150-7.5
T1 - Term. 3 & 5	4.7VAC	4.7VAC	4.7VAC
T2A & B Term. 1 & 3	85VAC	85VAC	85VAC
T3 - Term. 3 & 4	16.5VAC	16.5VAC	66VAC
Term. 4 & 5	16.5VAC	16.5VAC	66VAC
C1 (across)	4.7VDC	4.7VDC	4.7VDC
CR1 (across)	3.8VDC	3.8VDC	3.8VDC
Q1 E to B	0.15VDC	0.15VDC	0.15VDC
C to B	5.3VDC	5.3VDC	5.3VDC
Q2 E to B	0.17VDC	0.17VDC	0.17VDC
C to B	4.9VDC	4.9VDC	4.9VDC
Q3 E to B	0.22VDC	0.22VDC	0.22VDC
C to B	5.1VDC	5.1VDC	5.1VDC
Q3Ic	130MADC	130MADC	130MADC
R11 (across)	4.1VDC	4.1VDC	4.1VDC

Front

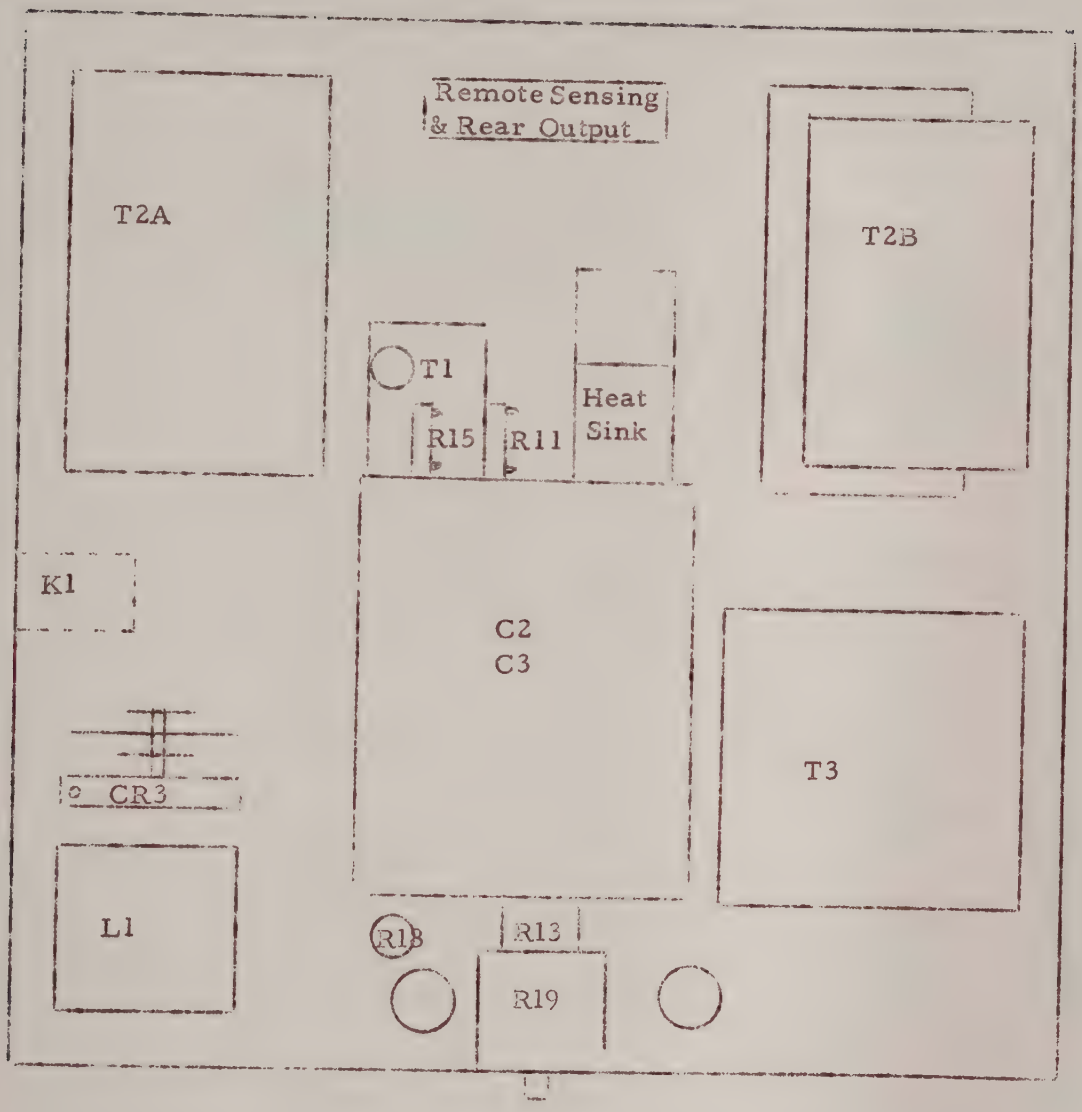


* Chassis Layouts - Model MR36-30



Rear View

* The Model MR150-7.5 is similar in appearance.



Chassis Layout - Model MR36-15
Top View

CONTROLLED POWER FOR RESEARCH AND INDUSTRY

CONTROLLED POWER FOR RESEARCH AND INDUSTRY

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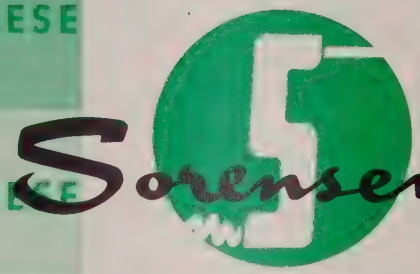


AC

ELECTRONIC REGULATORS

MAGNETIC VOLTAGE REGULATORS

400 CYCLE REGULATORS

TUBELESS REGULATORS

FREQUENCY CHANGERS

VOLTAGE REFERENCE SOURCES

DC

LOW VOLTAGE HIGH CURRENT

HIGH VOLTAGE LOW CURRENT

WIDE RANGE, ADJUSTABLE OUTPUT

TUBELESS REGULATED SOURCES

TRANSISTOR POWER SUPPLIES

400 CYCLE POWER SUPPLIES

CONDENSED STANDARD SPECIFICATIONS

SORENSEN & COMPANY, INC., • SOUTH NORWALK • CONN.

Model E-6-15A

NOBATRONS (Reg. U.S. Pat. Off.)

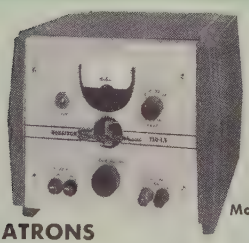
(low-voltage, high-current, regulated DC sources).

Closely regulated, efficient and stable DC supplies ideally suited for laboratory and industrial applications.

Models available (numbers indicate voltage & current) E-6-15A, E-6-40A, E-6-100A, E-12-5, E-12-15, E-12-50A, E-12-75, E-28-5, E-28-10, E-28-30, E-28-70, E-28-150, E-48-15, E-125-10, E-200-5.

ELECTRICAL CHARACTERISTICS

Input	95-130 VAC, 1ϕ, 50-60 cycles. 190-260 VAC, 1ϕ, for E-28-70. 120/208, 3ϕ, 4-wire wye for E-28-150.
Reg. accuracy	$\pm$0.2% against line (105-125 volts or 200-240 volts). $\pm$0.2% against load (1/10 to full)
Ripple	1% max. at 60 cycles (0.1% with Filter Sections available for units up to 50 amps.)
Output voltage adjustment range	6 volt units, 5.4 to 7.7 volts. E-12-50A, 9.0 to 17.6 volts. E-12-75, 10.0 to 15.5 volts. E-200-5, $\pm$50%. all others +10%, —20%
Recovery time	0.2 seconds on all models but E-28-70 (0.25 sec.) and E-28-150 (0.3 sec.)



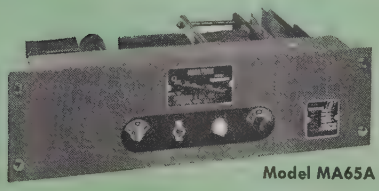
Model T50-1.5

T-NOBATRONS

Variable voltage, low cost tubeless supplies especially designed for transistor circuit work. Excellent line voltage regulation and transient response for line and load pulses. For normal line voltage surges, the DC output voltage will remain within regulation limits.

ELECTRICAL CHARACTERISTICS

Model	T50-1.5	T60-5	T120-2.5
AC Input (60 ~ , 1ϕ)	95-130	95-130	95-130
DC Output Voltage (three ranges)	0-10 0-25 0-50	0-10 0-25 0-60	0-25 0-50 0-120
Output Current (amps.)	0-1.5	0-5	0-2.5
Regulation, line: 105-125 V	$\pm$1%	$\pm$0.5%	$\pm$0.5%
for wider input	$\pm$2%	$\pm$1.0%	$\pm$1%
Internal Resistance, typical (ohms)			
low-voltage range	1.2	.35	1.3
middle range	2.1	.55	2.0
high range	4.5	1.0	4.0
Ripple (mv)	50 max.	50 max.	50 max.
Time Constant (line)	0.08 sec.	0.08 sec.	0.08 sec.
(load)	0.15 sec.	0.15 sec.	0.15 sec.



Model MA65A

TUBELESS REGULATED DC SOURCES

Designed for industrial applications and unattended installations, these regulated supplies utilize magnetic amplifiers and provide the utmost in long life and reliable maintenance-free service.

ELECTRICAL CHARACTERISTICS

Model	MA65A	MA640	MA1220	MA2850
Input (VAC, 60~)	105-125, 1ϕ	105-125, 1ϕ	105-125, 1ϕ	190-230, or 210-250, 3ϕ 4 wire, wye
Output (VDC)	5.4-6.6, adj.	4.5-7.7, adj.	11-15 or 12-16, adj.	23-32, adj.
Load Range	0-5 amp.	0-40 amp.	0-20 amp.	0-50 amp.
Reg. accuracy	$\pm$0.2% for line or load	$\pm$1.0% for any combination of line and load		
Ripple	1% max.	1% max.	1% max.	3% max.
Recovery Time	0.15 sec.	0.20 sec.	0.30 sec.	0.50 sec.

Model SR2

NOBATRON-RANGERS

(wide-range-variable regulated DC sources).

These versatile and popular instruments have electrical characteristics similar to the standard Nobatrons, except that output voltage is continuously adjustable.

ELECTRICAL CHARACTERISTICS

Input	95-130 VAC, 1ϕ, 50-60 cycles for SR30 and SR100. 190-260 VAC, 1ϕ, 50-60 cycles for the SR2.		
Reg. accuracy	$\pm$0.25% at any voltage setting		
Ripple	1% RMS max.		
Output: Model	SR100	SR30	SR2
VDC	5-135	5-30	100-300
Amps	1-10	3-30	1-10

400-CYCLE INPUT NOBATRONS

These instruments are not normal production items but are available on an extended delivery schedule.

ELECTRICAL CHARACTERISTICS

Output voltage and load range	Model DE-6-40 — 6 VDC at 4 to 40 amperes. Model DE-12-10 — 12 VDC at 1 to 10 amperes. Model DE-28-10 — 28 VDC at 1 to 10 amperes.
Input voltage	105-125 VAC, 1ϕ, 360-440 cycles.
Reg. accuracy	$\pm$0.25%.
Ripple	1% RMS maximum.
Recovery time	0.2 seconds.

FILTER SECTIONS FOR 50 & 60 CYCLE NOBATRONS

The ripple voltage of all Nobatrons is 1% of the nominal output voltage setting, under worst conditions. This is adequate for most applications. If, however, less ripple is required, Filter Sections are available for use with units rated up to 50 amperes, which will reduce the ripple to 0.1%.

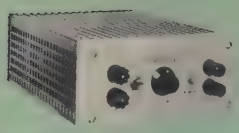
Model MA6501

PRECISION REGULATED TUBELESS DC SOURCE

A transistorized precision regulated DC source utilizing magnetic amplifier principles. This highly-stable, temperature-compensated unit is Sorensen's new design for use with the Beckman Model DU Spectrophotometer.

ELECTRICAL CHARACTERISTICS

Input	105-125 VAC, 1ϕ, 60 cycle.
Output	#1 — 6 VDC adjustable internally $\pm$5%, 5 amperes load. #2 — 6 VDC, 100 milliamperes load. #3—2 VDC, 30-60 milliamperes
Reg. accuracy	$\pm$0.01% against line $\pm$0.1% against load
Ripple	30 mv RMS max. on #1 and #2 10 mv RMS max. on #3
Stability	Typical stability after a 30 minute warm-up is .01% for an eight hour period.



Model Q6-2

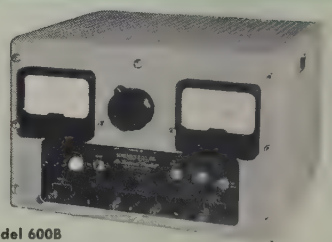
ALL-TRANSISTOR DC SUPPLY

Newest development in light, compact low-voltage power supplies. Completely transistorized, the Q6-2 is a well-regulated DC supply with excellent ripple and transient response characteristics. Two units may be racked side-by-side in standard 19" rack.

ELECTRICAL CHARACTERISTICS

Input	105-125 VAC, 50-60 cps
Output	6 VDC, adjustable $\pm$10%* 0-2 amperes
Regulation	$\pm$0.25% for any combination of line and load changes
Ripple	0.02% max.
Time constant	100 microseconds max.

*$\pm$20% adjustment possible at half load.



Model 600B

B-NOBATRONS

(high-voltage, low-current, regulated DC supplies).

Designed to meet the broadest technical and economical requirements. Conservatively rated, and requiring minimum service, these wide-range B-Supplies feature exceptional adaptability and rugged construction. The internal impedance figures given are from measurements in accordance with IRE specifications for measurement of power supply internal impedance.

ELECTRICAL CHARACTERISTICS

Model	300 B	325 BB	560 BB	500 BB	600 B	1000 BR
Output (VDC)	0-300	0-325	0-500	0-500	0-600	200-1600
Output (Ma)	0-150	0-125	0-200	0-300	0-500	0-50(
Regulation	<0.25%	<0.5%	<0.5%	<0.5%	<0.25%	<0.5%
Ripple (MV-RMS)	5 max.	5 max.	5 max	5 max	3 max	20 max
Bias supply (VDC at 0-5 Ma)	none	0-150	0-150	0-150	0-150	non
Int. impedance (max.)	2.0 ohms	2 0 ohms	2 0 ohms	2 0 ohms	2 0 ohms	2.0 ohms
AC input range (50-60~, 1ϕ)	105-125	105-125	105-125	105-125	105-125	105-125
AC voltage (~2.5%, C.T., unreg.)	6.3 at 5 amp*	6.3 at 10 amp	6.3 at 10 amp.	6.3 at 10 amp.	6.3 at 15 amp	
Max. bias circuit impedance		25000 ohms	25000 ohms	25000 ohms	50000 ohms	

*Two outputs, Series or Parallel

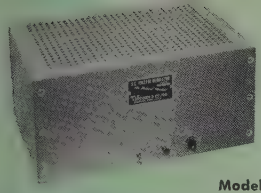
Model MR3215

MAGNETIC RANGERS

Rugged tubeless DC power supplies requiring negligible maintenance, Magnetic Rangers provide wide range, continuously adjustable, well-regulated voltage at high current. One versatile instrument can satisfy a wide variety of your DC needs.

ELECTRICAL CHARACTERISTICS

Input	105-125 VAC, 1ϕ, 50-60 cycles
Output voltage	5-36 VDC, continuously adjustable
Output current	MR3215: 0-15 amps MR3230: 0-30 amps
Reg. accuracy	$\pm$0.5% against line $\pm$0.5% against load
Ripple	1% RMS at 36 volts
Recovery time	0.2 sec.



Model 1000S

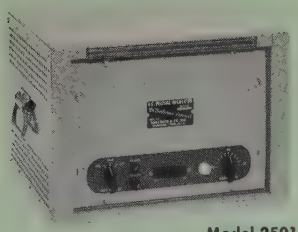
AC REGULATORS *(electronic).*

Utilizing the original Sorensen circuit and incorporating the *Safety Diode*, these regulators are noted for accuracy, economy of operation, easy maintenance. Models available with capacities from 150VA to 15KVA, single phase.

Models available (Numbers denote VA capacities) 150S, 250S, 500S (-2S also), 1000S (-2S also), 2000S, 3000S (-2S also), 5000S (-2S also), 10000S (-2S also), 15000S (-2S also).

ELECTRICAL CHARACTERISTICS

Input	95-130 VAC, 1ϕ, 50 or 60 cycles $\pm$10%. 190-260 VAC in "-2S" models.
Output	115 VAC adj. 110-120; 230 VAC with "-2S" models.
Reg. accuracy	$\pm$0.1% against line, $\pm$0.1% against load.
P.F. range	Unity to 0.7 lagging.
Distortion	Varies to 3% max. under worst conditions.
Load range	0 to full load.



Model 2501

PRECISION AC REGULATORS

(electronic).

Giving ultra-precise, $\pm$0.01% regulation, these instruments are rugged and serviceable, as proved by hundreds of applications in the field. Models available with capacities of 1000VA and 2500VA.

ELECTRICAL CHARACTERISTICS

Input	95-130 VAC, 1ϕ, 50 and 60 cycles.
Output	115 VAC, 1ϕ, adj. 110-120.
Reg. accuracy	$\pm$0.01% against line, $\pm$0.01% against load.
Distortion	3% maximum.
P.F. range	Unity to 0.7 lagging.
Load range	0 to full load.

Model APR 1010

TUBELESS MULTI-PURPOSE AC LINE REGULATOR

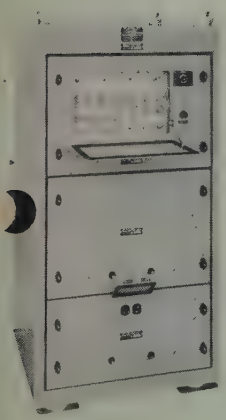
(Average, peak, or RMS regulation)

First regulator of its kind. Designed to regulate average, peak, or RMS value as selected. May also be used as DC controller. Saves space, eliminates instrument duplication, means greater economy. Five principal sensing arrangements: Internal, external, remote, constant current, DC.

ELECTRICAL CHARACTERISTICS

Input	95-130 VAC, 1ϕ (50 or 60 cps $\pm$10%)
Output	115 VAC, adj. 110-120 v.
Reg. accuracy *(RMS, average, or peak, switch selected)*	$\pm$0.1% against line $\pm$0.1% against load
Distortion	3% max.
Load	0-1000 VA
P.F. range	Unity to 0.7 lagging
Recovery time	0.1 sec.

SPECIAL EQUIPMENT



Typical militarized power supply

Sorensen also manufactures a wide range of special equipment including computer power supplies and militarized units. For unusual climatic conditions, many standard and special designs are available with "Fosterited" or potted wound components.

MILITARIZED UNITS

Over the years, many versions of standard Sorensen products have been designed for military applications. While there is no all-encompassing military specification for voltage regulators, Sorensen can provide equipment with MIL-preferred components throughout, designed to meet MIL-T-27A for wound components and in accordance with MIL-E-4158A or MIL-E-16400A. Typically, the newest militarized units to be featured as standard catalog items are the 500MIL and the soon-to-be-released 1500MIL. These are rugged 500 and 1500 VA militarized regulators conforming as above, and offering 1% total regulation accuracy against line, load, and frequency changes, with an ambient temperature range of —40° C to +55° C.

COMPUTER POWER SUPPLIES

In the design of standard and special equipment, Sorensen is outstanding in its application of alternate engineering approaches to the specific customer requirement. Rather than concentrate on any one particular design—electronic, tubeless magnetic amplifier, magnetic voltage regulator, etc.—Sorensen can draw on all types without prejudice or limitation.

In the area of computer power supplies, for instance, broad experience has been gained in the design and production of regulated and semi-regulated supplies using each of these approaches, singly or in combination.

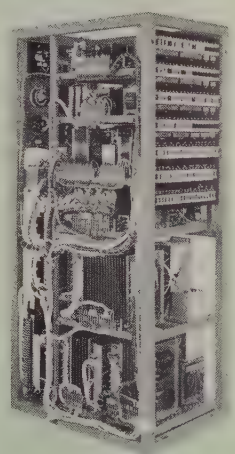
Let Sorensen apply its experience to your computer supply problems. We can provide a complete solution through our separate facilities, engineering, and production personnel specifically devoted to the design and volume production of computer power supplies.

AIRBORNE ELECTRONIC FREQUENCY CHANGERS AND INVERTERS

Sorensen has designed and built a wide variety of frequency changers and inverters for incorporation in military aircraft. For the most part, the changers convert variable (3200-1000~) input power to precision ($\pm$0.05%) output frequency. Most models are also voltage regulated ($\pm$1%) with minimum distortion (5-10%).

Airborne inverters are built to convert 28 VDC input to 400-cycle, 3-phase output, with output frequency accurate to 0.05% over wide ambients.

Sorensen's wide experience with commercial and military frequency changers may well supply the answer to your precision frequency problems. Our complete line of standard frequency changers is outlined on the next page.



Typical multi-voltage computer power supply

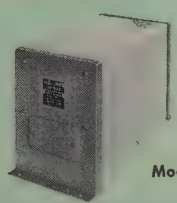
Model VRS-AC751

AC VOLTAGE REFERENCE SOURCE

Provides highly stable AC voltage for many laboratory and industrial uses such as direct calibration of voltmeters and oscilloscopes, servo testing, amplifier gain checks. Compact, large power capacity, precisely regulated, finely calibrated.

ELECTRICAL CHARACTERISTICS

Input	105-125 VAC, 1ϕ, 60 $\pm$0.5 cps
Output	0.1 to 799.9 VAC in 0.1-volt steps
Load	240 VA
Output voltage accuracy	$\pm$0.25% (Much greater accuracy possible through correction curves)
Generated distortion	1% maximum



Model MVR1000

MVR's (magnetic voltage regulators)

These low-cost magnetic voltage regulators are tubeless, give utmost reliability with good regulation. Very compact, they are ideally suited for incorporation as components. Available in capacities of 15, 30, 60, 120, 250, 500, 1000, and 2000 VA (designated MVR15, MVR30, etc.). Also available with 6.3 volt isolated output in 30, 60, and 160 VA capacity, (—6 models).

For low-distortion requirements up to 120 VA, specify harmonic-filtered MVRH120 (less than 3% distortion). 12.6 volt MVR's and a more complete extension of 6.3 volt and harmonic-filtered lines will be available shortly.

Input	95-130 VAC, 1ϕ, 60 cycles.
Output	115 VAC nominal (except 6.3 volt filament regulators)
Reg. accuracy	$\pm$0.5% against line.
Load range	0 to full load.

Model D2500SAN

400-CYCLE AC REGULATORS

Designed especially for airborne and ground testing installations for aircraft, missiles, gyros and related 400-cycle applications. Military type components and construction; all wound components are Fosterited. Available in models D250SAN, D500SAN, D1200SAN, D2500SAN (numbers 250, etc. denote VA capacities).

ELECTRICAL CHARACTERISTICS

Input	95-130 VAC, 1ϕ, 400 cycles $\pm$10%.
Output	115 VAC, 1ϕ, adj. 110-120.
Reg. accuracy	$\pm$0.25% against line, $\pm$0.25% against load
Distortion	5% maximum.
P.F. range	Unity to 0.7 lagging.
Load range	0 to full load.

CONTROLLED POWER FOR RESEARCH AND INDUSTRY

FREQUENCY FLEXIBILITY

Sorensen electronic frequency changers convert 50 or 60 cycle line to well-regulated AC output at 60 cycles, 400 cycles, or a wide range of output frequencies. These convenient, portable sources have found general application in aviation, missile, automatic control and related fields.

1000VA FREQUENCY CHANGERS

Model FC 1000 (45-65 cps out.)
Model FCD 1000 (360-440 cps out.)

ELECTRICAL CHARACTERISTICS

Input	208 or 230 VAC ±10% 1ø, 50 or 60 cycles
Output voltage	115 VAC, adj. 105-125V
Voltage regulation	±1%
Output frequency	(FCD 1000) 360-440 cps (FC 1000) 45-65 cps
Regulation accuracy	±1% (±0.01% with auxiliary frequency standard fixed at 50, 60 or 400 cps.)
Load range	0-1000 VA

Model FCD1000

WIDE RANGE FREQUENCY CHANGERS

Model FCR250

Latest, most versatile additions to the Sorensen line of regulated electronic frequency changers. Operating from 50 or 60 cycle line, these voltage- and frequency-regulated units permit simple dial selection of any frequency within a wide output range. Portable and practical, these instruments offer unique solutions to a wide variety of your laboratory, test, or production requirements.

	FCR100	FCR250
Input	105-125VAC, 1 phase, 45-65 cps	105-125VAC, 1 phase, 48-65 cps
Output voltage	115VAC, adj. 0-130V (specs below for 105-125V)	115VAC, adj. 105-125V
Output frequency		
Range 1	45-300 cps	320-570 cps
Range 2	300-2000 cps	560-1000 cps
Voltage Regulation	±1% for line ±1% for load	±1% for all variations
Frequency Regulation	±1% (provision for ext. freq. standard of greater precision.)	±1% (±0.01% with aux. freq. standard fixed at 400 cycles.)
Load range	0-100 VA	0-250 VA (up to 500 watts with improved reg. at 400 and 800 cps)

CONTACT THESE LOCAL REPRESENTATIVES

Whatever your power control requirements—for industry, military applications or research—you will find a unit which meets your *exact* specifications in Sorensen's wide variety of instruments, coupled with the extensive line of high-voltage equipment produced by the Beta Electric Division. In addition to their many standard products, both Sorensen and Beta have unusual experience in the engineering and production of special equipment to meet unique requirements. The authorized local representatives listed below are at your service; call the one nearest you for advice on Sorensen or Beta equipment.

CALIFORNIA—Palo Alto
McCarthy Associates
441 W. California Ave.
Phone Davenport 5-6136

CALIFORNIA—Pasadena
McCarthy Associates*
1055 E. Walnut
Phone Sycamore 2-8272

CALIFORNIA—San Diego 1
McCarthy Associates
934 West Laurel St.
Phone Belmont 9-4015

COLORADO—Denver 10
Lahana & Company
1886 South Broadway
Phone Pearl 3-3791 TWX DN676

CONNECTICUT—Bridgeport
Yewell Associates, Inc.
1101 East Main Street
Phone Forest 6-3456

D. C.—Washington 9
Horman Associates, Inc.*
2017 S. Street, N.W.
Phone Decatur 2-5705 TWX WA559U

FLORIDA—Fort Myers
Arthur H. Lynch & Assoc.
35 West North Shore Ave.
P. O. Box 466
Phone Edison 4-4431

GEORGIA—Atlanta 5
Bivins & Caldwell, Inc.*
3133 Maple Drive, N.E.
Phone Cedar 3-7522 TWX 987U

ILLINOIS—Chicago 45
Pivan Engineering Co.*
2820 Peterson Ave.
Phone Briargate 4-9135

MARYLAND—Baltimore
Horman Associates, Inc.*
635 St. Johns Road
Phone Hopkins 7-2290

MASSACHUSETTS—Burlington
Yewell Associates, Inc.*
Middlesex Turnpike
Phone Burlington 7-2561

MICHIGAN—Detroit 35
S. Sterling Company*
15310 W. McNichols Road
Phone Broadway 3-2900

MINNESOTA—Minneapolis 3
Pinkney & Hine
1925 Nicollet Ave.
Phone Federal 8-0523 TWX, Minn. Code FMR

MISSOURI—Kansas City 30
Harris-Hanson Co.
7916 Paseo Avenue
Phone Hiland 6744 TWX KC448

MISSOURI—St. Louis 17
Harris-Hanson Co.
2814 So. Brentwood Blvd.
Phone Mission 7-4350 TWX WEB237

NEW JERSEY—Asbury Park
The I. E. Robinson Co. (branch)
905 Main St.
Phone Kellog 1-3150

NEW JERSEY—Bogota
RMC Associates, Inc. (branch)
114 E. Main St.
Phone Diamond 3-5926

NEW YORK—New York
RMC Associates, Inc.*
236 E. 75th Street
Phone Trafalgar 9-2023 TWX NY 1-3805

NEW YORK—Rochester 18
J. D. Ryerson Associates, Inc.
105 Pickwick Drive
Phone Greenfield 3-3706

NEW YORK—Syracuse 2
J. D. Ryerson Associates, Inc.*
412 E. Genesee Street
Phone 76-8344 TWX SS-312

NORTH CAROLINA—Charlotte
James L. Highsmith Co.
P. O. Box 1011
Phone Franklin 5-6436

OHIO—Cleveland 21
S. Sterling Company (branch)
4311 Mayfield Road
Phone Evergreen 2-4114

OHIO—Dayton 2
S. Sterling Company (branch)
379 West 1st Street
Phone Fulton 8794

OREGON—Portland 16
James L. Kearns Company†
P. O. Box 5108
Phone Belmont 6-2444

PENNSYLVANIA—Camp Hill
The I. E. Robinson Co. (branch)
2120 Market Street
Phone Regent 7-6791

PENNSYLVANIA—Pittsburgh 36
H. E. Ransford Co.
5400 Clairton Blvd.
Phone Tuxedo 4-3425

PENNSYLVANIA—Upper Darby
The I. E. Robinson Company*
7404 West Chester Pike
Phone Flanders 2-7017 TWX Flanders 533

TEXAS—Dallas 9
Earl Lipscomb Associates*
P. O. Box 7084
Phone Fleetwood 8-1771 Teletype DL-411

TEXAS—Houston 5
Earl Lipscomb Associates (branch)
P. O. Box 6573
Phone Jackson 4-9303

WASHINGTON—Seattle
Hawthorne Electronics††
107 Administration Bldg.
Boeing Field
Phone Mohawk 3962

WASHINGTON—Seattle
James L. Kearns Company†
Phone Mutual 4566
Mail: Portland Office

HAWAII—Honolulu 17
Gene Piety
2030 Home Rule Street
Phone 83105

CANADA—Ajax, Ontario
Bayly Engineering, Limited*
1st Street
Phones: Toronto Empire 8-6866, Ajax 118

CANADA—Vancouver 2, B. C.
Arva
229 Rogers Bldg.
Phone Pacific 3367

MEXICO—Mexico City
Electro Labs. S.A.
Guanajuato #121
Phone 11-60-94

**Complete service facilities maintained for rapid local servicing of Sorensen and Beta equipment.*
†Sorensen line only.
††Beta line only.

WRITE FOR LITERATURE

Send for complete information, including specifications, performance data and quotations. Product data sheets are issued on all new units as they become available. Inquiries regarding special applications and specifications are invited. Address Sales Engineering Department, Sorensen & Co., Inc., Richards Ave., South Norwalk, Conn., or (for high voltage applications) write Beta Electric Division, 333 East 103rd Street, New York 29, New York; or contact the local representative shown above. In Europe, please contact directly Sorensen-Ardag, Eichstrasse 29, Zurich 3, Switzerland.

West Coast Field Office: 1055 East Walnut St., Pasadena, Calif.

Sorensen

SORENSEN & CO., INC. • RICHARDS AVE., SOUTH NORWALK, CONN.
PHONE: TEMPLE 8-6571

Printed in U. S. A.

SERIES 200 PORTABLE
HIGH VOLTAGE DC POWER SUPPLIES

0-30 KV, 2 & 5 ma

FEATURES:

- Lightweight and Portable
- Air Insulation
- Reversible Polarity
- Safe and Reliable

SPECIFICATIONS:

OUTPUT VOLTAGE—0-30,000 volts DC, continuously variable.

OUTPUT CURRENT—2.0 ma at 30 KV, 3 ma below 28 KV (Model 230-2); 5ma at 30 KV, 7 ma below 24 KV (Model 230-5).

HIGH VOLTAGE POLARITY — Reversible

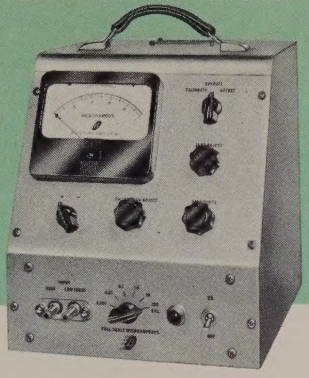
RIPPLE—Approximately 1.0% per ma at 30 KV.

OUTPUT CAPACITANCE—0.005 mf in series with 0.5 megohm, plus output lead capacitance (app. 150 mmf).

REGULATION—Internal resistance 2.5 megohms.

METERS—KV meter 0-30 KV DC, ±2.5% initial accuracy. Ammeter 0-1 amp AC, ±3% initial accuracy (Model 230-2), Load current meter 0-10 ma DC (Model 230-5).

In addition to standard models in this Series, BETA offers more elaborate versions for research, development and similar exacting work.



MODEL 301-A
ELECTRONIC MICROAMMETER

FEATURES:

- Highly sensitive
- Rugged; impervious to overloads
- No moving parts
- Self-calibrating

SPECIFICATIONS:

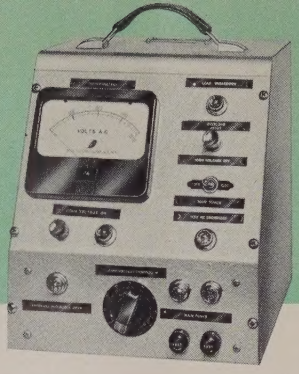
POWER—95-125 volts, 50-60 cycle AC, 60 VA.

RANGES — 0.001/0.01/0.1/1.0/10/100 μa, full scale.

ACCURACY—5% full scale on 0.001 range. 3% on all other ranges.

INPUT VOLTAGE SENSITIVITY—40 millivolts DC, full scale; constant for all ranges.

METER—4"-square bakelite case, 50 dial graduations, 1.0 μa full scale.



SERIES 800
PORTABLE AC HIPOT TESTERS

0-2 KV to 0-20 KV, 1-5 ma

FEATURES:

- Automatically-limited maximum short circuit current
- High-speed overload cutoff relay
- Direct indication of insulation breakdown
- Direct reading kilovoltmeter across output

SPECIFICATIONS:

WAVEFORM DISTORTION — Less than 5% sine wave at no load.

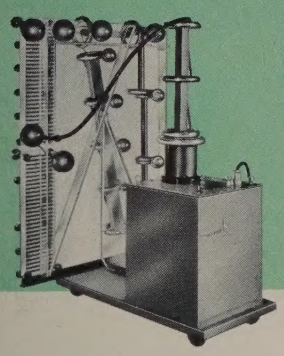
METER—4" square bakelite-cased, ±5% full scale accuracy.

HV CONTROL—On-Off pushbutton.

OUTPUT VOLTAGE & CURRENT — 0-2 KV, 1 ma; 0-5 KV, 2 ma; 0-10 KV, 3 ma; 0-15 KV, 4 ma; 0-20 KV, 5 ma.

BETA HIGH VOLTAGE EQUIPMENT

See preceding page for local representatives.



SERIES 4000
AIR-INSULATED, SELENIUM-RECTIFIED HIGH VOLTAGE POWER SUPPLIES

250 KV, 2 ma

FEATURES:

- Lightweight, easily maneuverable
- Components unusually accessible for servicing
- Low corona
- Extremely long operational life

SPECIFICATIONS:

INPUT VOLTAGE — 105-125 volts, 50-60 cycles, single phase.

INPUT VOLTAMPERES—Approximately twice rated maximum output power.

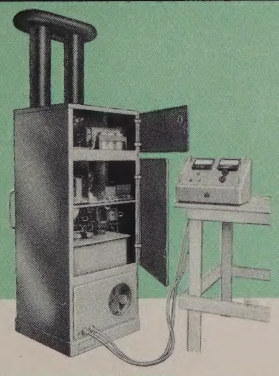
OUTPUT VOLTAGE — Continuously variable from zero to 250 KV.

OUTPUT CURRENT—2 ma can be drawn continuously at maximum voltage.

POLARITY—Reversible via manual positioning of rectifier ladders.

REGULATION—Unregulated, with internal impedance of 11 megohms; However, full-rated voltage and current are obtainable.

In addition to standard models in this Series, BETA offers more elaborate versions for research, development and similar exacting work.



SERIES 6000 REGULATED
HIGH VOLTAGE DC POWER SUPPLIES

FEATURES:

- Electrostatic generator
- Electronic voltage regulation and stabilization
- Unusually compact and lightweight
- Low-short-circuit current

SPECIFICATIONS:

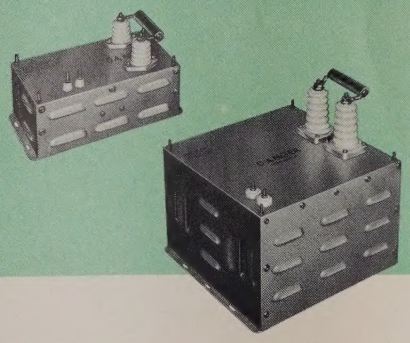
POWER INPUT—220 volts, 50-60 cycle, 3 phase.

OUTPUT VOLTAGE — 50-150 KV and 5-150 KV (cont. var.)

OUTPUT CURRENT—2.4 ma maximum.

REGULATION—±2% (load) ±4% (line) or ±0.2% (load) ±0.1% (line)

POLARITY—Negative (standard)



SERIES 9000
"HI-SEL" DC POWER PACKS

5-15 KV, 2.5 & 5 ma

FEATURES:

- Air-insulated
- Selenium rectifiers
- Low ripple in all current ratings
- Good dynamic load regulation

SPECIFICATIONS:

OUTPUT VOLTAGE (KV)	OUTPUT CURRENT (ma)	DIMENSIONS	WEIGHT (lbs.)	RIPPLE (rms)
0-5	5	7¾h" x 4¼"w x 3"d	6	1.5%
0-10	2.5	8"h x 6"w x 5"d	10½	1.0%
0-10	5	8"h x 6"w x 5"d	10½	2.0%
0-15	2.5	9"h x 8½"w x 6"d	13	0.5%
0-15	5	9"h x 8½"w x 6"d	13	1.0%

Models with ratings up to 30 KV available shortly.

SERIES 1000 RACK-MOUNTED HIGH VOLTAGE DC POWER SUPPLIES

0-1 to 0-50 KV, 2-500 ma

FEATURES:

- **Rugged construction**
- **Conservative design**
- **Fully self-protected**
- **Minimum operational hazards**

SPECIFICATIONS:

REGULATION—Unregulated, but full rated current is available at maximum voltage. Regulation at maximum output voltage varies 15-50%.

RIPPLE—At maximum rated voltage and current in any voltage range, ripple is below 2.5% rms for the maximum current in that range.

SELENIUM RECTIFIERS—Employed in most designs with current ratings below 10 milliamperes.

POLARITY—Reversible standard, center-tapped on special order.

METERS—3½" output voltage and current meters, ±3% full-scale accuracy on all ranges.

VOLTAGE & CURRENT RANGE—0-1 KV, 500 ma; 0-3 KV, 200 ma; 0-5 KV, 10 ma; 0-5 KV, 50 ma; 0-5 KV, 100 ma; 0-10 KV, 2 ma; 0-10 KV, 10 ma; 0-10 KV, 50 ma; 0-15 KV, 2 ma; 0-15 KV, 5 ma; 0-15 KV, 10 ma; 0-30 KV, 2 ma; 0-30 KV, 5 ma; 0-30 KV, 10 ma; 0-50 KV, 2 ma; 0-50 KV, 5 ma.

SERIES 2000 AIR AND OIL INSULATED HIGH VOLTAGE DC POWER SUPPLIES

0-1 to 0-250 KV, 5-3000 ma

FEATURES:

- **Two-unit construction for remote operation**
- **Maximum personnel and equipment protection**
- **Conservatively rated**
- **Simple to operate**

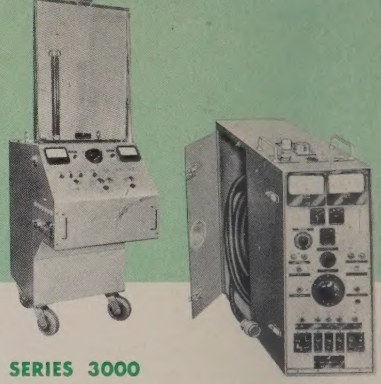
SPECIFICATIONS:

POLARITY: Reversible by interchanging links in the high voltage section.

REGULATION: Unregulated. However, *full-rated voltage and current* are obtainable from all units.

OUTPUT VOLTAGE & CURRENT: 0-1000 V, 3000 ma; 0-3000 V, 1000 ma; 0-5000 V, 400 ma; 0-10KV, 200 ma; 0-20 KV, 150 ma; 0-30 KV, 30 ma; 0-50 KV, 10 ma; 0-50 KV, 50 ma; 0-100 KV, 5 ma; 0-120 KV, 5 ma; 0-150 KV, 5 ma; 0-250 KV, 10 ma; 0-250 KV, 5 ma (Cockroft-Walton).

In addition to standard models in this Series, BETA offers more elaborate versions for research, development and similar exacting work.



SERIES 3000 DC OVERPOTENTIAL TESTERS

0-30 to 0-150 KV, 1-5 ma

FEATURES:

- **Minimum size and weight**
- **Non-destructive, qualitative and quantitative dielectric testing**
- **"Burn" currents available for positive fault identification**
- **Effective personnel and equipment protection**

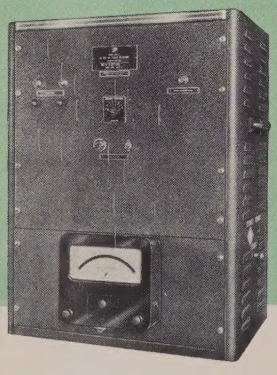
SPECIFICATIONS FOR ALL MODELS

INPUT VOLTAGE — 105-125 volts, 50-60 cycles, single phase.

OUTPUT VOLTAGE — Continuously variable from zero to maximum rated voltage, adjustable to 0.03% of maximum rating. 30KV, 5ma; 50KV, 5ma; 80KV, 2ma; 120KV, 1ma; 80KV, 5ma; 120KV, 5ma; 150KV, 5ma.

OUTPUT CURRENT — Maximum rated current can be drawn continuously at maximum voltage.

POLARITY—Reversible.



SERIES PKV PEAK-READING KILOVOLTMETERS

0-20 to 0-50 KV

FEATURES:

- **High accuracy and sensitivity**
- **High stability—dependable long-term readings**
- **Narrow pulsewidth measurement—as low as 1 μsec**
- **Optional despiking—eliminates wave overshoots**

SPECIFICATIONS:

DUTY CYCLE RANGE—From DC (1.0) to as low as 0.00025.

REPETITION RATE RESPONSE—Charging time constant of less than 1 μsec and discharge constant of approximately 1 second, for repetition rates between 5 cps and all radio frequencies.

ACCURACY — ±1% or ±3% (optional), with 100 μa DC full-scale sensitivity.

INPUT IMPEDANCE — Approximately 8 mmf with high voltage positive, 38 mmf with high voltage negative.

POLARITY — Reversible via internal lead interchange.

VOLTAGE RANGES—0-20 KV, 30 KV and 50 KV.

SERIES KV PORTABLE & SEMI-PORTABLE, SINGLE & DUAL RANGE KILOVOLTMETERS

0-15 to 0-200 KV

FEATURES:

- **Linear scales**
- **Stabilized multipliers**
- **Ample overload factor**
- **Compact, Convenient, Rugged**

LOW-DRAIN PORTABLE KILOVOLTMETERS
0-15 to 0-50 KV

VOLTAGE RANGES — 0-15, 0-30, 0-50, 0-15/30, 0-25/30 KV.

SENSITIVITY—25,000-50,000 ohms/volt.

ACCURACY—±1% or ±3% full-scale (optional).

LOW-DRAIN SEMI-PORTABLE KILOVOLTMETERS
0-100 to 0-200 KV

VOLTAGE RANGES—0-100, 0-150, 0-200 KV.

SENSITIVITY—10,000 and 20,000 ohms/volt.

ACCURACY—±3% full-scale, ±1% ⅔-scale.

BETA

first in high voltage

Beta Electric has, for more than 10 years, specialized in the research, design, development and production of DC and AC high voltage equipment. The unique experience gained through these years of custom manufacture of compact, reliable equipment for specialized applications has resulted in efficient standardization of design, with the retention of flexibility and versatility inherent in custom design.

WRITE Sales Engineering Dept. for individual product data sheets, or for consultation on special requirements.

BETA ELECTRIC

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